

**STANDARD  
SPECIFICATIONS  
FOR ROAD AND BRIDGE  
CONSTRUCTION**

**Adopted January 1, 2002**

**with updates from the  
SUPPLEMENTAL  
SPECIFICATIONS**

**Adopted January 1, 2002**

**Excerpts:**

**Work Zone Traffic Control**



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## SECTION 100. GENERAL REQUIREMENTS AND COVENANTS

### SECTION 101. DEFINITION OF TERMS

#### (Select Terms)

**101.01 Abbreviations.** Wherever the following abbreviations are used in these Specifications or on the plans, they are to be construed the same as the respective expressions represented:

**101.16 Equipment.** All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the work.

**101.21 Local Traffic.** Local traffic is traffic whose immediate destination is within the limits of construction or closure, limited to use by persons for necessary access to real property not otherwise accessible by another public way.

**101.22 Materials.** Any substances specified for use in the construction of the project and its appurtenances.

**101.36 Roadside.** A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

**101.38 Roadway.** The portion of the right of way within limits of construction.

**101.39 Shoulder.** The portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, emergency use, and lateral support of base and surface courses.

**101.51 Traffic Control Plan.** Those portions of the contract plans, Special Provisions, Specifications, and Supplemental Specifications having to do with temporary traffic control.

## INDEX TO SELECT WORK ZONE TRAFFIC CONTROL ITEMS

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**SECTION 700. WORK ZONE TRAFFIC CONTROL, SIGNING  
AND PAVEMENT MARKING****SECTION 701. WORK ZONE TRAFFIC CONTROL**

**701.01 Description.** This work shall consist of the furnishing, installation, maintenance, relocation, and removal of all traffic control devices according to the contract.

**701.02 Materials.** Materials shall be according to the following Articles of Section 1000 - Materials:

Item	Article/Section
(a) Flashing and Steady Burning Barricade Lights .....	1084.01
(b) Pavement Marking Tape .....	1095.06
(c) Construction and Maintenance Signs .....	1084.04
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(e) Temporary Rumble Strips .....	1084.03

**CONSTRUCTION REQUIREMENTS****701.03 Equipment.**

Item	Article/Section
(a) Arrow Boards .....	1106.03
(b) Sign Trailers .....	1106.04
(c) Truck Mounted Attenuators .....	1106.01

**701.04 General.**

- (a) Applications. Traffic control and protection shall be according to the traffic control plan, Section 702 Traffic Control Devices, or as directed by the Engineer. The number, type, color, size, and placement of all traffic control devices shall be according to the traffic control plan, the Department's "Manual on Uniform Traffic Control Devices for Streets and Highways", and the Department's "Quality Standard for Work Zone Traffic Control Devices".

All existing pavement markings which conflict with the revised traffic pattern shall be removed according to Section 783.

Work shall not begin until the Engineer has determined the traffic control devices meet the quality requirements. Traffic control standards or designs included in the plans specify the minimum required combination of traffic control devices needed for a particular construction operation. Revisions or modifications of these standards or designs to fit field conditions shall be approved by the Engineer in writing.

Conditions created by the Contractor's operation, and not controlled by the contract shall be protected by safety devices at the Contractor's expense and as directed by the Engineer.

Temporary traffic control devices shall remain in place only as long as needed and shall be removed as soon as practical when directed by the Engineer. Placement of any of these devices may be adjusted to fit field conditions. Signs that do not apply to current conditions, shall be removed, covered, or turned from the view of motorists. Any traffic control device which has become ineffective due to damage or defacement shall be replaced by the Contractor. All traffic control devices shall be kept clean and properly oriented in reference to traffic.

At the preconstruction conference, the Contractor shall furnish the name of the individual in the Contractor's direct employ who is to be responsible for the installation and maintenance of the traffic control for the project. When the actual installation and maintenance are to be accomplished by a subcontractor, consent shall be requested of the Engineer at the time of the preconstruction conference. This shall not relieve the Contractor of furnishing a responsible individual in the Contractor's direct employ. The Department will provide the Contractor the name of its representative who will be responsible for the administration of the Traffic Control Plan.

For all projects which affect the flow of traffic for more than one day, form BT 725 will be required.

The maximum length of lane closure on multilane highways shall not exceed one day's production or 5 km (3 miles), whichever is greater, except lane closures up to 8 km (5 miles) in length will be permitted for portland cement concrete patching and continuously reinforced concrete patching operations. Gaps between successive lane closures shall not be less than 3 km (2 miles) in length.

(b) Contractor's Operations and Equipment.

- (1) General. The Contractor shall keep all equipment, material, and vehicles off the pavement and shoulders on the side of the pavement which is open to traffic. Except where controlled by flaggers, the Contractor shall operate vehicles and equipment in the direction of traffic while traveling and working on the pavement and shoulders of a two-lane two-way highway. On a multilane highway, the Contractor shall operate vehicles and equipment in the direction of traffic while traveling and working on the pavement and shoulders.

Excavation for construction on both sides of the pavement at any one location at the same time will not be permitted. At any location on existing pavements less than three lanes in width, the sequence of construction shall limit operations to one side of the pavement.

The maximum allowable differential in elevation between adjacent open traffic lanes shall be 50 mm (2 in.). At locations where construction operations result in a differential in elevation exceeding 75 mm (3 in.) between the edge of pavement or edge of shoulder within 900 mm (3 ft) of the edge of the pavement and the earth or aggregate shoulders, Type I or II barricades or vertical panels shall be placed at 60 m (200 ft)

centers on roadways where the posted speed limit is 45 mph or greater and at 30 m (100 ft) on roadways where the posted speed is less than 45 mph. This delineation will be considered as included in the contract unit prices for the work and no additional compensation will be allowed.

- (2) Surveillance. When open holes, broken pavement, trenches over 75 mm (3 in.) deep and 100 mm (4 in.) wide or other hazards are present adjacent to an open lane, in a closed lane, or adjacent to the closed lane, the Contractor shall furnish Traffic Control Surveillance during all hours when the Contractor is not engaged in construction operations. The surveillance person(s) shall be provided with adequate transportation and communications to ensure deficiencies can be corrected. The surveillance person(s) shall drive over and inspect the work, maintain the temporary traffic control devices, and assist and direct traffic, at such intervals as may be required, not to exceed four hours. The person responsible for surveillance shall complete an inspection form, furnished by the Engineer, on a daily basis. The completed form shall be given to the Engineer on the first working day after the inspection.
- (3) Equipment Parking and Storage. During working hours, all vehicles and/or nonoperating equipment which are parked, two hours or less, shall be parked at least 2.5 m (8 ft) from the open traffic lane. For other periods of time during working and for all nonworking hours, all vehicles, materials, and equipment shall be parked or stored a minimum of 9 m (30 ft) from the pavement when the project has adequate right of way. When adequate right of way does not exist, vehicles and materials shall be located at least 4.5 m (15 ft) from the edge of any pavement open to traffic, unless located behind temporary concrete barrier, temporary bridge rail, or other man-made or natural barriers. Temporary barriers erected for protection by the Contractor shall meet the approval of the Engineer. When authorized by the Engineer, vehicles, materials, or equipment may be parked or stored, less than 4.5 m (15 ft) from any pavement open to traffic.

Any unattended obstacle or excavation in the work area which constitutes a hazard in the opinion of the Engineer, shall be protected by barricades at 15 m (50 ft) centers, having flashing lights at night. If the hazard exceeds 30 m (100 ft) in length, steady burning lights shall be substituted for flashing lights. When the distance is greater than 75 m (250 ft), barricade spacing may be increased to 30 m (100 ft).

When not being utilized to inform and direct traffic, construction speed limit signs, arrow boards, and message boards shall be treated as nonoperating equipment.

- (4) Crossovers. The Contractor will be permitted to make "U" turns across the median at existing maintenance crossovers or crossovers constructed by the Contractor, provided the width of the crossover is adequate to ensure no disruption of traffic on the through lanes and at locations permitted by the Engineer. The use of median crossovers will not be permitted within 400 m (1320 ft) of the speed change taper of an

interchange ramp, within 600 m (2000 ft) of the taper for a lane closure, or when the construction traffic will be entering or exiting the only open lane within a construction zone. Crossovers shall conform to minimum sight distance requirements. The cost of constructing, maintaining, and removing temporary crossovers and the restoration of the median shall be at the Contractor's expense. When the crossover is being used, two signs shall be placed in the median and two signs shall be placed opposite on the outside shoulder of the highway in advance of the crossover on the side where trucks enter the highway. The first pair, approximately 300 m (1000 ft) from the crossover, shall be 1.2 m (48 in.) "MERGE RIGHT" signs. The second pair, approximately 450 m (1500 ft) from the crossover, shall be 1.2 m (48 in.) "TRUCKS ENTERING ON LEFT" signs. The warning signs in advance of the crossover in the other direction shall be as listed above except the second pair shall be "TRUCKS LEAVING ON LEFT". All warning signs required at median crossovers shall be at the Contractor's expense.

(c) Flaggers.

- (1) General. The flagger shall be stationed to the satisfaction of the Engineer and be equipped with a vest of fluorescent orange, fluorescent orange with strong yellow/green stripes or strong yellow/green vest having fluorescent orange stripes and approved flagger traffic control signs conforming to Standard 702001 and Article 702.05(e). The longitudinal placement of the flagger may be increased up to 30 m (100 ft) from that shown on the plans to improve the visibility of the flagger. Flaggers will not be required when no work is being performed, unless there is a lane closure on two-lane, two-way pavement.
- (2) Two Lane Highways. Two flaggers will be required for each separate operation where two-way traffic is maintained over one lane of pavement. Work operations controlled by flaggers shall be no more than 1600 m (1 mile) in length. Flaggers shall be in sight of each other or in direct communication at all times. Direct communication shall be obtained by using portable two-way radios or walkie-talkies.
- (3) Multilane Highways. At all times where traffic is restricted to less than the normal number of lanes on a multilane pavement with a posted speed limit greater than 40 mph and the workers are present, but not separated from the traffic by physical barriers, a flagger shall be furnished to protect the workers and to warn and direct traffic. One flagger will be required for each separate activity of an operation that requires frequent encroachment in a lane open to traffic.
- (4) Flagger Certification. All flaggers engaged in work zone traffic control operations are required to be certified by the Illinois Department of Transportation or by an agency approved by the Department. While on the job site, each flagger shall have in his/her possession a current drivers license and a current flagger certification I.D. meeting Department requirements. For non-drivers, the Illinois Identification Card issued by the Secretary of State will meet the requirement for a current drivers license. This flagger certification shall not apply to any

emergency situations that arise due to actions beyond the Contractor's control where flagging is needed to maintain safe traffic control on a temporary basis.

- (5) **Flagger Signals.** The flagger signaling methods shall comply with those contained in the Department's Flagger Handbook.
  - (6) **Night Time Flagging.** The flagger station shall be lit by additional overhead lighting other than street lights. The flagger vest shall have vinyl retroreflective stripes that maintain retroreflectivity when wet. The retroreflective material shall be orange, yellow, white, silver or strong yellow/green. It shall be visible at a minimum distance of 300 m (1000 ft) and shall be designed to identify the wearer as a person through the full range of body motions.
- (d) **Traffic Control Modification.** Revisions in the staging of construction or maintenance operations may require traffic control to be installed according to Standards other than those included in the contract plans. If required, the Standards will be made available to the Contractor at least one week in advance of the modification of the traffic control. A modification to increase the traffic control shown in the plans by the Contractor must be submitted to the Engineer for approval. A reduction in the traffic control will not be allowed except as provided herein.

A reduction in the number of flaggers from that shown on the contract may be permitted when the road is closed to through traffic and it is necessary to provide access for local traffic. If the average daily traffic is 400 or more, or is not shown in the contract, the Contractor shall furnish flaggers and traffic control devices according to the contract. When the road is closed to through traffic, but open to local traffic and the average daily traffic, as shown in the plans is less than 400, but more than 100, one flagger will be required for each separate operation where two-way traffic is maintained over one lane and no flaggers will be required where at least one unobstructed lane of traffic is maintained, in each direction on multilane pavements. When the average daily traffic is less than 100, no flaggers will be required unless the Contractor's operation encroaches on the open traffic lane, during which time one flagger shall be provided at the Contractor's expense. If the average daily traffic volume is less than 400, the Engineer may require additional flaggers to protect hazardous conditions and such additional flaggers will be paid for according to Article 109.04.

- (e) **Temporary Rumble Strips.** Temporary rumble strips shall be placed snugly against one another and attached to the pavement with an adhesive meeting the recommendations of the rumble strip manufacturer.
- (f) **Truck Mounted Attenuators.** Trailing vehicles shall be between 60 m and 150 m (200 ft and 500 ft) behind the lead vehicles.

**701.05 Specific Procedures.****(a) Shoulders.****(1) Aggregate.**

When bituminous resurfacing is being constructed and the road is opened to traffic, there shall be no more than 6.5 lane km (4 lane miles) of new binder or surface adjacent to the shoulder without either completing the shoulders, providing barricades or vertical panels, erecting "LOW SHOULDER" signs at 3.2 km (2 miles) intervals, or constructing a temporary earth wedge against the edge of pavement and compacting it to the satisfaction of the Engineer.

For edge of pavement/shoulder drop-offs exceeding 76 mm (3 in.) the Contractor shall provide barricades or vertical panels according to Article 701.04(b)(1).

**(2) Portland Cement Concrete.** When the curing period for the concrete shoulders, as required in Article 1020.13, has been completed, the Engineer will determine when traffic will be permitted on the shoulders.

No traffic will be permitted on the shoulders until test specimens, according to Article 1020.09, have attained a minimum flexural strength of 3,500 kPa (500 psi), or a minimum compressive strength of 19,000 kPa (2,700 psi). If such tests are not conducted, traffic will not be permitted on the shoulders until 14 days after the concrete is placed. The Contractor may request additional test specimens be made and tested if he/she wishes to permit traffic on the shoulders earlier than the normal testing frequency. These specimens will be cured in the same manner as the shoulders.

**(b) Base Course.****(1) Aggregate Base Course.** The road or any section 1.5 km (1 mile) or more in length shall be opened to traffic immediately after it has been completed.**(2) Soil-Cement Base Course.** The finished soil-cement base course may be opened immediately to local traffic and to the Contractor's construction equipment. The base may be opened to all traffic after the seven day protection period, provided the base course is not damaged, marred, or distorted by such traffic, and provided the protection and cover specified in Article 352.12 is not impaired.**(c) Surface Courses and Pavement.** Where construction operations on two-lane roads open to traffic result in the removal or covering of any pavement striping indicating passing restrictions, "NO PASSING ZONES NOT STRIPED NEXT MILES" signs shall be used. The Contractor shall place the signs at the beginning of the unstriped area, just beyond each major intersection within the unstriped area, and at other locations as directed by

the Engineer to ensure a minimum spacing of 8 km (5 miles). The signs shall be placed just prior to removal or covering of the striping and shall remain in place until full no passing zone striping has been restored.

- (1) Prime Coat. The "FRESH OIL" (W21-2) sign shall be erected when prime and fine aggregate are applied to pavement that is open to traffic. The signs shall remain until tracking of the prime ceases as directed by the Engineer. The signs shall be erected a minimum of 150 m (500 ft) preceding the start of the prime.
- (2) Cold Milling. The "ROUGH GROOVED SURFACE" (W8-1107) signs shall be erected when the road has been cold milled and opened to traffic. The signs shall remain in place until the milled surface condition no longer exists. These signs shall be erected a minimum of 150 m (500 ft) preceding the start of the milled pavement and shall have an amber flashing light attached.
- (3) Bituminous Concrete Binder and Surface Course Class I. The road shall be kept open to traffic on the existing pavement or on the new work. During the actual cleaning of the pavement and the placing of the mixture for cracks, joints and flangeways, prime coat, leveling binder; binder and surface courses, one-way traffic will be permitted. At all other times, two-way traffic will be allowed to use the road.
- (4) Bituminous Treated Earth Surface. When blotter aggregate is not specified, the road shall be closed to traffic during the application of the bituminous material and shall remain closed for a period of not less than 48 hours after the final application, or longer if deemed necessary by the Engineer. Excess bituminous material remaining on the surface at the time the road is closed to traffic, shall be covered with a thin layer of loose earth sufficient to absorb the surplus bituminous material.

When blotter aggregate is specified, the road may be opened to traffic immediately after the application of blotter aggregate.

- (5) Bituminous Surface Treatment and Surface Plant Mix (Class B). The surface may be opened to traffic as soon as it has cured sufficiently to prevent the material from being picked up by the wheels of vehicles passing over it.
- (6) Portland Cement Concrete Pavement. When the curing period for the pavement, according to Article 1020.13, has been completed and the joints have been sealed, as required in Article 420.10, and protective coat, when required, is applied, the Engineer will determine when the pavement shall be opened to traffic. The earliest the pavement will be opened to traffic will be when test specimens according to Article 1020.09 have attained a flexural strength of 4,500 kPa (650 psi) or a compressive strength of 24,000 kPa (3500 psi). If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete is placed. Prior to opening to traffic, the pavement shall be cleaned. The Contractor may request additional test specimens be made and tested if the Contractor wishes to open the

pavement to traffic earlier than the normal testing frequency. These specimens will be cured in the same manner as the pavement. All traffic including construction traffic shall be limited to legal axle weights (legal loads).

(d) Structures.

- (1) Concrete Superstructures and Floors. Concrete superstructures and floors shall be opened to traffic according to Articles 503.05, 503.06, and 1020.13 and after protective coat, when required, is applied and final texturing or grooving is completed unless stage construction is utilized. On projects utilizing stage construction, saw cut grooving may be deferred until at least two adjacent lanes have been constructed.
- (2) Box and Pipe Culvert Extensions. Box culvert and pipe culvert extensions shall be protected with barricades until the backfill over the extensions is complete and no longer poses a hazard to traffic.
- (3) Storm Sewers Jacked in Place. The construction operations shall be carried on without encroachment upon the traveled way by either the excavation or by the storage of equipment or materials. When open cut excavation encroaches upon the shoulder, the excavation shall be protected according to Article 701.04(b).
- (4) Bridge Washing. The entire bridge roadway and roadways below shall be kept open to traffic at all times, other than when actual work is being performed. While actual work is being performed, one-half the roadway may be closed to traffic at the option of the Contractor. One-way traffic shall be permitted over the other half of the roadway if the bridge roadway is less than 12.2 m (40 ft) in width. Two-way traffic shall be permitted over the other half of the roadway if the bridge roadway width is 12.2 m (40 ft) or more between curbs. Traffic control devices shall be as specified for each bridge.

(e) Pavement Patching.

- (1) Keeping Road Open to Traffic. Traffic shall be permitted to use the road at all times. All construction operations shall be arranged to facilitate the movement of traffic.
  - a. Open Traffic Lane. On two-lane pavements, construction operations shall be confined to one traffic lane, leaving the opposite lane open to traffic. On four-lane pavement, construction operations shall be confined to one traffic lane in each direction, leaving the other two traffic lanes open to traffic throughout the period of construction.
  - b. Temporary Traffic Control Devices. In addition to the traffic control and protection shown elsewhere in the contract for multi-lane pavement, the Contractor shall place two barricades or drums without lights immediately in front of each open patch or other excavation within a closed lane adjacent to an open lane where

temporary concrete barriers are not used to separate traffic from the work area. One barricade or drum shall be placed at the edge of the open traffic lane and one barricade or drum centered in the closed lane. A check barricade shall be placed in the middle of the closed lane and at the shoulders at 300 m (1000 ft) centers. Requirements for lights on barricades or drums will be according to Article 702.03(e) and 702.04.

When patching on ramps, a minimum of three standard 1.2 m (48 in.) signs ("RAMP CONSTRUCTION", "NARROW LANE", and "FLAGGER" or Flagger Symbol signs) and one flagger shall be required as directed by the Engineer. The work area shall be delineated by Type I or Type II barricades at 15 m (50 ft) spacing or closer if directed by the Engineer. Cones may be substituted for barricades during daylight hours. This work shall be included in the cost of Standard 701406 or 701401.

Barricades or drums being used to separate traffic from the work area may be moved up to 15 m (50 ft) from their specified location. Flaggers, when required, shall be provided according to Article 701.04(c).

- c. Scoring. As soon as the scoring operations are completed and before the barricades are removed, all spalls and broken pieces of concrete shall be removed from the pavement and shoulders. Waste material shall be disposed of by the Contractor according to Article 202.03.
- d. Broken Pavement and Open Holes.
  - 1. Multilane Roadways. The total area of pavement broken and not removed for concrete patching shall not exceed 1/2 of the total area of broken pavement which can be removed in an average day's work. The total area of holes left open overnight for concrete patching shall not exceed 1/2 of the pavement area which can be replaced in an average day's work. All open holes, broken pavement and patches shall be barricaded as shown on the plans. No materials removed from patches shall remain on the right of way overnight.

No open holes, broken pavement, or partially filled holes shall remain overnight on bituminous patching or when use of the special patching mixture is required, except for conditions beyond the Contractor's control.
  - 2. Two Lane Roadways and Ramps. No open holes, broken pavement, or partially filled holes shall remain overnight and all barricades shall be removed before dark, except for conditions beyond the Contractor's control.

## (2) Opening Road to Traffic.

- a. **Cleaning Up.** Prior to opening the pavement to traffic, the entire right of way adjacent to the patching operations shall be cleared of all materials caused by the Contractor's operations, and the backfill along the shoulder edge of the pavement shall be compacted to the satisfaction of the Engineer.
- b. **Strength Tests.** The patch may be opened to traffic when test specimens cured with the patch have obtained a minimum flexural strength of 4,100 kPa (600 psi) or a compressive strength of 22,000 kPa (3200 psi). With the approval of the Engineer, concrete strength may be determined through the use of a maturity meter according to AASHTO T 276. At the age of two days, testing will be permitted for high-early-strength concrete, rich-mix portland cement concrete, or a concrete mixture containing an approved accelerator.
- c. **Special Mixture.** The special patching mixture according to Article 1020.05(g)(2) shall be utilized when specified. These patches shall be cured and opened to traffic during daylight hours on the same day the patches are constructed.

Patches constructed of the special patching mixture on ramp pavements and two-lane pavements with two-way traffic may be open to traffic when beams cured with the patches achieve a flexural strength of 2100 kPa (300 psi), or a compressive strength of 11,000 kPa (1600 psi) determined as specified in Article 1020.09. For all other pavements, patches constructed with the special patching mixture may be opened to traffic when beams cured with the patches achieve a flexural strength of 3800 kPa (550 psi) or a compressive strength of 20,200 kPa (2,933 psi).

When use of the special patching mixture is required and patches cannot be opened before sunset, the additional traffic control required will be provided by the Contractor at his/her own expense. The Contractor will be required to change his/her operations if she/he consistently cannot have all patches open before nightfall.

- (f) **Guardrail.** Traffic control for the installation, maintenance, and/or removal of guardrail shall be provided, as applicable to two-lane or multi-lane roadways, according to the following Highway Standards included in the plans:

Two-lane Roadways

Standard 701006  
 Standard 701011  
 Standard 701201  
 Standard 701301  
 Standard 701311

Multi-lane Roadways

Standard 701101  
 Standard 701106  
 Standard 701406  
 Standard 701426

In addition to applicable Standard requirements, Type I or II barricades with lights shall be placed at 15 m (50 ft) centers at all locations where guardrail is temporarily removed or where the installation is incomplete. The barricades shall remain in place until the guardrail installation is completed.

Guardrail removal and/or installation shall be coordinated to prevent delays in completion. Guardrail removal and/or installation shall be scheduled so no installations are left unfinished when the work is suspended for the winter or other extended periods of time.

These Standards will not be paid for separately and all costs shall be included in the applicable guardrail installation, maintenance, and/or removal pay items.

**701.06 Highway Standards Application.** Standards for work zone traffic control shall be applied to locations according to existing posted speed limits.

- (a) Standard 701006 and 701011. When the work operation requires four or more work vehicles enter through traffic lanes in a one hour period, a flagger shall be provided and a "FLAGGER" sign shall be substituted for the "WORKER" sign.
- (b) Standard 701316 and 701321. The exact location of the signals, detector loops, stop bars, and signs shall be as directed by the Engineer.

Advisory speed signs or plates, showing a speed of 10 mph less than the normal posted speed shall be installed.

The Contractor shall notify the Engineer for inspection, at least 72 hours in advance of placing the signals in operation.

The District Engineer shall be notified one week prior to a traffic lane width reduction.

Any damage to the temporary traffic signals from any cause shall be repaired at the Contractor's expense. If at any time the Contractor fails to perform any work deemed necessary by the Engineer to keep the temporary traffic signals in proper operating condition, the Department reserves the right to have other electrical Contractors perform the needed work, and the cost will be deducted from compensation due or which may become due the Contractor under the contract.

- (1) Standard 701316. During daytime operations when workers are present, the Engineer may allow Type I or Type II barricades to be placed parallel to the centerline. Cones may be substituted for barricades at half the barricade spacing during the daytime operations.
- (2) Lane Closure on Two-Way, Two-Lane Rural Road. The Contractor shall furnish, install, maintain, and remove temporary traffic signals including a traffic actuated controller, a cabinet, detector amplifiers, and other associated equipment as listed below and on Standards 701316 and 701321 for each location specified. The Contractor shall have

available one spare controller and cabinet. The Contractor shall retain ownership of all traffic control equipment, miscellaneous accessories, and the installation methods shall be according to the following:

- a. Traffic Signal Heads. Two signal heads shall be provided for each mainline approach and for each sideroad within the designated work area. All signal faces shall have new lamps when installed. When the signals are not operating, the signal head shall be hooded according to Article 880.03 and the "SIGNAL AHEAD" sign covered or removed. The left signal head shall be mounted at a height of 3.1 m (10 ft) above the road surface measured to the bottom of the signal head. The right signal head shall be mounted at a height of 4.3 m (14 ft) above the road surface. Back plates will be required on all signals.

The right signal head shall be aimed so the centers of the light beams of the indications are directed toward a point in the center of the approach lane 150 m (500 ft) in advance of the signal. The left indication shall be aimed at a point in the center of the approach lane 30 m (100 ft) in advance of the stop line.

- b. Lenses. All lenses shall be 300 mm (12 in.) nominal diameter.
- c. Wire and Cable. The Contractor shall supply all overhead and underground wiring for both signal circuits and loop detector lead-ins. The electric cable shall be aerially suspended, at a minimum height of 2.5 m (8 ft) and as close to the right of way line as possible. When the electric cable crosses a roadway, or entrance it shall be aerially suspended, at a minimum height of 5.5 m (18 ft), according to the local utility requirements, or placed in a trench with a minimum of 50 mm (2 in.) of cover or protected in a manner approved by the Engineer.
- d. Mounting. The controller shall be mounted on a post, pole, or temporary concrete foundation. The signal heads shall be mounted on 7.5 m (25 ft) standard tubular steel posts or on a minimum Class 4 wood pole, when overhead wiring is used between signals. Alternative methods of mounting the cabinet or signal heads shall be approved by the Engineer. The supports shall be kept in a vertical position for the duration of the project.
- e. Service Installation. The Contractor shall be responsible for the installation and cost of 110 V electrical service. When the service cable from the controller to the power source is suspended overhead, the line height shall not be less than 2.5 m (8 ft) above the ground and located as close to the right of way lines as practicable. When the cable crosses a roadway or entrance, the cable shall be raised to a minimum height of 5.5 m (18 ft) or pass under the pavement through a culvert opening. Portable power generating equipment may be used for a short period of time until local power is available, provided at least one person is present at all times at the site to ensure proper operation.

## f. Traffic Signal Controller.

1. The controller shall be a standard eight phase NEMA controller housed in a weather proof cabinet. The traffic signals shall dwell in All-Red. The long all red intervals shall be adjustable up to 99 seconds in one second increments. Long all red intervals shall be obtained by using a trail green feature or an equivalent or by using dummy phases. The long all red interval shall be pre-empted if the previous movement is detected before the conflicting movement is detected and shall cause the previous movement to return to the green display with a minimum four second delay. When a conflict or failure is detected, the signal shall display a flashing All-Red. When an additional phase is used for a side road movement, only one long red interval shall be used between active phases on each side of the work area.

All devices used, in lieu of controller software to produce this sequence, shall be mounted within the cabinet but not within the controller. The Contractor shall provide an operational demonstration of the controller assembly for the Engineer subsequent to installation and prior to being placed into operation. The Contractor shall program the controller, trouble shoot, and correct any problems that arise, and verify the equipment is functioning according to the contract. If any controller malfunction occurs during the time of operation or in the event of a power failure, the Contractor shall, without delay, provide flaggers for traffic control and immediately install a replacement controller to operate the signals.

2. When specified, the Department will furnish the traffic actuated controller. The controller, complete with loop detector-amplifiers and pole mount cabinet, shall be picked up and returned upon completion of the project to the location designated on the plans. The Contractor shall provide notice to the Department at least two weeks in advance of requiring the traffic actuated controller. The Contractor shall be responsible for maintenance of the controller and all related equipment within the controller cabinet. The controller shall be inspected by the Contractor and Engineer subsequent to installation and prior to being placed into operation. Any malfunction of the Department owned equipment revealed during the inspection by the Contractor shall be repaired and will be paid for according to Article 109.04. The Contractor shall be responsible for any damage to the Department-owned equipment as a result of negligence or poor workmanship during installation at his/her expense. The Contractor shall provide all maintenance required, at his/her expense, to keep the Department-owned equipment functioning properly after being placed in operation.

- g. Detector Loops. Three detector loops shall be installed on each approach as shown on the plans. The near detector loops shall be placed 300 mm (12 in.) from the centerline and the far loop shall be placed 300 mm (12 in.) from the edge line. Each loop shall be connected to a separate detector amplifier channel. Call delay feature shall be used for the loops nearest the stop lines and defeated during the green of that phase. An alternate method of detection may be used if it has been demonstrated and approved by the Department.

The loop detector lead-in cable shall be protected from construction and maintenance activities. In the event of detector loop failure, the Contractor shall have 48 hours to repair or replace the loops. Upon completion of the project, the detector loop shall be terminated in such a manner as to provide for future use.

- (c) Standard 701326. No paving or excavating operations shall be performed at night unless authorized by the Engineer.
- (d) Standard 701336. Two flaggers shall be required for each separate construction operation. The flagger shall be a minimum of 60 m (200 ft) and a maximum distance of 1/2 day's operation beyond the flagger sign and a minimum of 30 m (100 ft) in advance of the work party.

Under restricted sight distance conditions, additional devices may also be required for distances less than 600 m (2000 ft) at the discretion of the Engineer.

During periods when workers are present all work areas shall be protected by cones or barricades along the centerline.

- (e) Standard 701101. When the work operation requires four or more work vehicles enter through traffic lanes in a one hour period, a flagger shall be provided and a "FLAGGER" sign shall be substituted for the "WORKER" sign. When the work operation is 4.5 m (15 ft) or more off the pavement edge, no signing or cones will be required, unless two or more vehicles cross the 4.5 m (15 ft) clear zone in one hour.
- (f) Standard 701406 and 701401.
  - (1) General. When Standard 701401 is specified for overnight operations, cones may be substituted for barricades or drums at half the spacing during day operations.
  - (2) Multilane Pavement Resurfacing. For the construction of binder course, surface course and shoulder resurfacing on multilane pavements, Standard 701406 or 701401 shall be used from the beginning of business on Monday to 4:30 p.m. on Friday. Only Standard 701406 may be used from 4:30 p.m. Friday to start of business on Monday.

- (3) Shoulder Upgrading and Replacement. The following shall apply to shoulder pipe underdrain installation and/or shoulder reconstruction on existing multilane divided highways.

The Contractor shall close the adjacent lane of pavement within the limits of the construction zone, when required by the Contractor's operations. When no workers are present and the difference in elevation between the pavement and the shoulder and/or widening is greater than 75 mm (3 in.), the Contractor shall place barricades according to Article 701.04(b).

During shoulder work on ramps, a minimum of two standard advance signs, a 1.2 m (48 in.) "RAMP CONSTRUCTION AHEAD", and a 1.2 m (48 in.) "FLAGGER AHEAD" or Flagger Symbol sign, and one flagger shall be used as directed by the Engineer. The work area shall be delineated by Type I or II barricades or vertical panels at 15 m (50 ft) spacings or closer if directed by the Engineer. Shoulder drop-offs greater than 40 mm (1 1/2 in.) caused by the Contractor's operations will be allowed only on one side of the ramp at a time. This work shall be included in the cost of Standard 701406 or 701401.

Standard 701401 will only be measured for payment where the average depth of shoulder reconstruction required by the plans, exclusive of any trench for pipe underdrain installation, is in excess of 75 mm (3 in.). Where such shoulder reconstruction is 75 mm (3 in.) or less, no open trench greater than 75 mm (3 in.) deep shall be permitted overnight. If, because of unforeseen circumstances, an open trench greater than 75 mm (3 in.) deep should occur overnight, the Contractor shall, at his/her own expense, close the adjacent traffic lane according to Standard 701401.

Excavations greater than 75 mm (3 in.) in depth between the pavement and shoulder, including any trenches within the shoulder area, shall be restricted to one shoulder in each direction of travel. In addition, shoulder drop-offs greater than 40 mm (1 1/2 in.) caused by the Contractor's operations will not be permitted over the winter shutdown.

The Contractor shall schedule the work so the lane closure at any one work area does not exceed five working days. The closure time may be exceeded for conditions beyond the Contractor's control, except if continual and persistent closures in excess of the five working days are made, the Engineer will initiate measures to delay or limit the daily production of the Contractor's operations.

All debris shall be removed from the shoulder and right of way prior to the removal of barricades, drums or vertical panels.

- (g) Standard 701416. Reflective solid edge lines and double yellow centerline shall be used when the closure time exceeds four days or when the normal posted speed outside the area of operations exceeds 80 km/h (50 mph). ReflectORIZED pavement marking tape shall be used for marking the edge lines and centerline on existing pavement. Either tape or reflectORIZED

pavement marking paint may be used for markings on the paved crossovers. Raised reflective pavement markers at 8 m (25 ft) centers shall also be installed under good weather conditions, for additional delineation.

When Standard 701416 is specified, the impact attenuator shall be positioned so as not to encroach onto the outer lane. Vertical panels may be attached to the concrete barriers where available space prohibits the use of drums.

When Standard 701416 is specified, vertical panels may be attached to concrete barriers where available space prohibits the use of drums.

- (h) Standard 701431. Reflective solid edge lines and a double yellow centerline shall be used when the closure time exceeds four days or when the normal posted speed outside the area of operations exceeds 50 mph. Reflectorized pavement marking tape shall be used for marking the centerline and edge lines on the existing pavement. Raised reflective pavement markers at 8 m (25 ft) centers shall be installed under good weather conditions to supplement the pavement marking tape. All existing pavement markings which conflict with the revised traffic pattern shall be removed.

Drums, or Type I or Type II barricades no greater than 600 mm (24 in.) wide, may be used in place of flexible delineators when the two-way operation is to be in place four days or less.

- (i) Standard 701426. Truck mounted attenuators will not be required for any vehicle traveling entirely on a completed shoulder.
- (j) Standard 701411. This Standard shall supplement mainline traffic controls for lane closures.

The channelizing devices shall clearly define a path for motorists entering or exiting the highway.

Reflectorized temporary pavement marking tape shall be placed throughout the barricaded area of each ramp where the closure time is greater than 14 days. Raised reflectorized pavement markers at 8 m (25 ft) centers may be used in lieu of tape where the pavement marking is to be placed adjacent to the barricades or drums.

- (k) Urban Traffic Control, Standards 701501, 701502, 701601, 701602, 701606, 701701, 701801.

- (1) General. "NO PARKING" signs shall be installed throughout the work area.

When the work area is in the parking lane and parking exists during work hours, "ROAD CONSTRUCTION AHEAD" or "ROAD WORK AHEAD" signs shall be installed 60 m (200 ft) in advance of the work area and the area shall be protected with cones or barricades.

Reflectorized temporary pavement marking tape shall be placed throughout the taper and along side the adjacent work area where the closure is greater than 14 days. The edge line shall be yellow for left lane closures.

- (2) Standard 701501. When Standard 701501 is specified on two-lane/two-way roadways, construction operations shall be confined to one traffic lane leaving the opposite lane open to traffic.
- (3) Standard 701606. When Standard 701606 is specified reflective pavement markings shall be used when the closure time exceeds four days. The double yellow center line shall be used in the two-way traffic area in addition to the barricades or drums. Single yellow left edge line shall be used to outline the barricade island. White right edge line shall be used along the barricades protecting the work area.
- (4) Standard 701801. On Standard 701801, where a temporary walkway encroaches on an existing parking lane, the lane shall be closed with cones, barricades, or drums.

Where a temporary walkway encroaches on a traveled lane, the lane shall be closed according to Standards 701501, 701606, or 701601.

All walkways shall be clearly identified, protected from motor vehicle traffic and free of any obstructions and hazards, such as holes, debris, construction equipment, and stored materials.

All hazards near or adjacent to walkways shall be clearly delineated.

When barricades are impractical to use or do not provide enough protection, orange safety fence shall be used to close off an area, with the approval of the Engineer.

#### **701.07 Method of Measurement.**

- (a) Not Measured. Traffic control and protection required under Standards 701001, 701006, 701011, 701101, 701106, 701301, 701311, and 701426 will not be measured for payment.
- (b) Standard 701401 will be measured for payment on an each basis only when the traffic control and protection applies to isolated stationary work areas and does not involve or is a part of other protected areas.

Where the contract work to be performed requires longitudinal movement of the work area, each subsequent installation of a Standard in a new location will be paid for according to Article 109.04. A contiguous lateral movement of the work area causing a change in the location of traffic control devices, but not a longitudinal relocation of the work area, will not be considered a new location or installation.

- (c) Measured As Lump Sum. Traffic control and protection required under Standards 701201, 701206, 701306, 701326, 701336, 701406, 701501,

701502, 701601, 701602, 701606, 701701 and 701801 will be measured for payment on a lump sum basis. Traffic control protection required under Standard 701401 will be measured for payment on a lump sum basis, except as specified under Article 701.07(b). Where the Contractor's operations result in daily changing, or two or more work areas each of which requires traffic control according to one of the above Standards, each work area installation will not be paid for separately, but shall be included in the lump sum price for the type of protection furnished.

- (d) Traffic Control Surveillance will be measured on a calendar day basis.
- (e) When constructing aggregate shoulders with bituminous resurfacing the cost of placing, compacting, maintaining, removing, and disposing of the temporary earth wedge will not be paid for directly, but shall be included in the contract unit prices for the construction items involved, and no additional compensation will be allowed.
- (f) Temporary rumble strips will be measured as each, where each is defined as an 8 m (25 ft) length installation.

**701.08 Basis of Payment.** The basis of payment for traffic control and protection will be as follows:

- (a) Traffic control and protection will be paid for at the contract unit price each for TRAFFIC CONTROL AND PROTECTION STANDARD 701316, TRAFFIC CONTROL AND PROTECTION STANDARD 701321, TRAFFIC CONTROL AND PROTECTION STANDARD 701331, TRAFFIC CONTROL AND PROTECTION STANDARD 701401, TRAFFIC CONTROL AND PROTECTION STANDARD 701402, TRAFFIC CONTROL AND PROTECTION STANDARD 701411, TRAFFIC CONTROL AND PROTECTION STANDARD 701416, TRAFFIC CONTROL AND PROTECTION STANDARD 701431 AT THE LOCATION SPECIFIED.

The replacement of any temporary pavement marking which has been in place for seven days or more will be paid for according to Article 109.04.

In the event the total value of the work items for which a traffic control Standard is required, is increased or decreased by more than ten percent, the unit price bid for that Standard will be adjusted as follows:

$$\text{Adjusted unit price} = .25P + .75P (1 \pm (X-0.1))$$

Where P is the bid unit price for the Standard

Where x =  $\frac{\text{Difference between original and final value of Work}}{\text{Original value of work requiring the use of the Standard}}$

Where (X - 0.1) is 0 if X is less than 0.1.

The value of the work items used in calculating the increase or decrease will include only items which have been added to or deducted from the contract under Article 104.02 and only items which require use of the Standard.

When the plans require multiple locations for the Standard and the Method of Measurement is on an each basis, the adjustment shall only be applied to the location(s) where added work is required.

- (b) Traffic control and protection indicated in Article 701.07(c) will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION
- |                  |                                   |
|------------------|-----------------------------------|
| STANDARD 701201; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701206; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701306; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701326; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701336; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701401; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701406; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701501; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701502; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701601; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701602; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701606; | TRAFFIC CONTROL AND PROTECTION    |
| STANDARD 701701; | or TRAFFIC CONTROL AND PROTECTION |
| STANDARD 701801. |                                   |

Any alterations (additional or replacement of temporary pavement markings, or increases or decreases in work items by more than ten percent for which a traffic control standard is required) will be paid for according to Article 701.08(a).

- (c) Temporary signals required for Standards 701316 and 701321 will be paid for separately at the contract unit price each for TEMPORARY BRIDGE TRAFFIC SIGNALS.

When the Department furnishes the controller for Standards 701316 or 701321 the temporary bridge traffic signals will be paid for at the contract unit price each for TEMPORARY BRIDGE TRAFFIC SIGNALS (STATE FURNISHED CONTROLLER).

Any relocation of the traffic signal equipment due to stage construction changes will not be paid for separately, but shall be included in the cost of the initial installation.

- (d) Temporary concrete barrier and end sections will be measured and paid for according to Section 704.

Sand module impact attenuators and temporary bridge rail will be paid for separately. Temporary rumble strips will be paid for at the contract unit price each for TEMPORARY RUMBLE STRIPS.

- (e) Traffic Control Surveillance will be paid for at the contract unit price per calendar day or fraction thereof for TRAFFIC CONTROL SURVEILLANCE.

The cost of the materials for the maintenance of traffic control devices shall be included in the various control pay items.

- (f) Should the Engineer require additional signs, flaggers, barricades or other traffic control devices over and above those specified, they will be paid for according to Article 109.04.

When the Contractor requests a change in the traffic control, any additional flaggers required will be at the Contractor's expense.

## SECTION 702. WORK ZONE TRAFFIC CONTROL DEVICES

**702.01 Description.** This work shall consist of furnishing, maintaining, and removing traffic control devices.

**702.02 Materials.** Materials shall be according to the following Articles of Section 1000 - Materials:

Item	Article/Section
(a) Reflective Sheeting .....	1084.02
(b) Construction and Maintenance Signs .....	1084.04

### 702.03 Channeling Devices.

- (a) General. Only the name and telephone number of the agency, Contractor, or supplier may be shown on the nonretroreflective surface of all channelizing devices. The letters and numbers shall be a nonretroreflective color and not over 50 mm (2 in.) in height.

Barricades, drums, cones, and/or vertical panels used for channelization or delineation along with warning signs shall be sequentially placed in the direction of the traffic flow and removed in reverse order. Lane closure and flagger signs shall be erected prior to barricades, drums, cones, and/or vertical panels and remain erected until all traffic control devices have been removed from the pavement.

All barricades, wing barricades, and vertical panels shall have alternating reflectorized white and reflectorized orange strips sloping downward at 45 degrees toward the side on which traffic will pass. Barricade stripes shall be 150 mm (6 in.) in width on barricades 900 mm (36 in.) or greater in length and 100 mm (4 in.) in width on barricades less than 900 mm (36 in.) in length. Type I and Type II Barricades shall be striped on both sides. Wing and Type III Barricades shall be striped on both sides where traffic approaches from either direction. Vertical panels placed on the outside of curves shall be striped on both sides. The predominant color for other barricade components shall be white, orange, or silver, except that galvanized metal or aluminum components may be used.

The lights on wing barricades, barricades, drums, or vertical panels shall be mounted above the top of the device to the side on which traffic will pass and shall not obscure any reflectorized portion of the device.

Cones, drums, and barricades shall not be mixed in individual runs of devices.

- (b) Barricades. Type 1 and 1A Barricades are for use on lower speed roads and shall not be used where normal posted speeds are greater than 40 mph unless the reflective area of the upper rail is at least 0.18 sq m (288 sq in.). Type I and Type II Barricades shall not be intermixed within an individual string of barricades. Type III barricades shall be used for road and lane closures.

Weights of concrete, stone, wood, or brick will not be allowed and all weights used to stabilize barricades, other than sandbags, must be rigidly attached to the legs of the barricades as close to the ground as possible. No sandbags will be allowed on the top rail of barricades. Sandbags may be placed on barricade legs, over striped bottom rails not facing traffic, over unstriped bottom rails, or suspended from the barricade rail or frame in such a manner so the bulk of the sand is at least 450 mm (18 in.) below the top of the barricade. Drums may be weighted internally with no more than enough sand or water to provide stability, or by other ballast system designed by the drum manufacturer and approved by the Department.

Barricade and wing barricade rails shall be no heavier than 25 mm (1 in.) thick lumber or plywood except for the sawhorse design Type 1A Barricade which may have a rail no heavier than 50 mm (2 in.) thick lumber. Other light weight weather resistant materials such as plastic, fiberglass, or sheet aluminum may be used. The face of the barricade rails may be sloping or vertical. Nominal lumber dimensions may be used to satisfy wooden barricade component dimensions.

For wing barricades, the optional back bracing on the wood or metal barricade may be used provided it attaches to the upright no higher than 300 mm (12 in.) above the bottom and if wood is used, the bracing shall be no heavier than 50 x 100 mm (2 x 4 in.) in size. Other light weight designs may be used with the approval of the Engineer.

Frames for Type I or Type II Barricades shall be designed to provide a stable support and should be constructed of light weight steel or aluminum angles, tubing, wood, plastic, or rubber and have no rigid stay bracing for "A" frame designs.

- (c) Vertical Panels. Vertical panels may be either post mounted, frame supported or attached to the top of a barrier. Post mounted vertical panels shall be firmly attached to light weight wood or metal posts with the top a minimum height of 1.2 m (4 ft) above the pavement surface. The frame and rail requirements for Type I and Type II barricades shall also apply to frame supported vertical panels. Frame supported vertical panels shall be used only where normal posted speeds are 40 mph or less with the top of the panel a minimum of 900 mm (36 in.) above the pavement.
- (d) Cones. Reflectorized cones are not required for day light operations, and shall only be used as specified on the plans or as approved by the Engineer.

When used, reflectorized cones shall have two white reflective bands. Cones shall be constructed of durable material able to withstand abuse by vehicular traffic. Minimum weights shall be 2 kg (4 lb) for 450 mm (18 in.), 3 kg (7 lb) for 700 mm (28 in.), and 5 kg (10 lb) for 900 mm (36 in.) cones with a minimum of 60 percent of the total weight in the base. Where posted speeds are greater than 40 mph cones shall be a minimum of 700 mm (28 in.) in height.

- (e) Drums. Drums shall be nonmetallic and have alternating reflectorized orange and reflectorized white horizontal, circumferential stripes. There shall be at least two orange and at least two white stripes on each drum. If nonreflective spaces are left between the orange and white stripes, they shall be no more than 50 mm (2 in.) in width. All nonreflectorized portions of the drums shall be orange. Drums may be slightly conical in shape and may have one or more flat surfaces to minimize rolling when hit. Drums shall have closed tops that shall prevent the collection of roadwork debris. Drums shall be weighted in a manner approved by the manufacturer so they are not moved by wind or traffic.

On construction projects where the ADT exceeds 25,000, plastic drums according to Standard 702001 with steady burning lights shall be used in lieu of Type I and Type II barricades throughout lane closures. They shall be placed at the location and spacing shown on the applicable traffic control standards.

Where plastic drums are specified, Type II barricades may be used in lieu of drums provided the barricades are made of plastic, fiberglass, or other nonmetallic materials, the top panels are 300 mm x 600 mm (12 x 24 in.); the bottom panels are 200 mm x 600 mm (8 x 24 in.), the orange and white reflective sheeting is Type A meeting the initial minimum coefficient of retroreflection in Article 1084.02, and all other requirements for Type II barricades are met. If flashing or steady burning lights are required for drums, this requirement shall be extended to the Type II barricades. Drums and Type II barricades shall not be intermixed within an individual taper or string of devices. This does not prohibit drums from being used in a taper section with Type II barricades being used in the tangent section, or vice versa.

- (f) Flexible Delineators. Flexible delineators shall be designed to bend under repeated impacts and return to an upright position without damage to the impacting vehicle or the delineators. They shall be attached to the pavement with adhesive meeting the recommendations of the delineator manufacturer. The use of studs will not be permitted without the approval of the Engineer.

The delineators shall be orange in color and have two reflectorized orange and two reflectorized white bands according to Article 1084.02.

The delineators shall be readily removable from the bases to permit field replacement. All missing or severely damaged delineators shall be replaced prior to suspension of work each working day and once each nonworking day on a schedule approved by the Engineer.

**702.04 Lights.** The Contractor shall be responsible for replacing lighting units that have become defective. The Contractor shall replace all light batteries on a group basis at such times as may be specified by the Engineer.

Lights will be required on barricades, drums, vertical panels, and signs according to the standards and as follows:

CIRCUMSTANCE	REQUIRED LIGHTING
Traffic Control Standard	As shown on Standard
Special Detail in Plans	As shown on Special Detail
First two warning signs on each approach to the work involving a nighttime lane closure	Flashing lights during hours of darkness
Barricades or drums used in lieu of cones for night operations. (Does not apply to patching operations.)	Steady burn lights bi-directional lights
Obstacles, isolated hazards, or isolated excavations	Flashing lights during hours of darkness
Obstacle, hazard, or excavation exceeding 100 ft in length. (Does not apply to widening operations)	Steady burn bi-directional lights
Drums and barricades for channelizing traffic.	Steady burn bi-directional lights.
Barricades and drums in tapers	Steady burn mono-directional lights
Barricades in widening trench	No lights required
Drums and barricades on projects with an ADT exceeding 25,000	Steady burn mono-directional lights
Drums and barricades protecting patches on projects with an ADT less than 25,000	No lights required
Drums and barricades protecting patches on projects with an ADT exceeding 25,000	Steady burn mono-directional lights
Construction speed limit sign	According to Article 702.05c.

Barricades or drums with lights shall be used in lieu of cones for night operations. Lights are not required on drums or barricades for day operations. Drums or barricades utilized to protect obstacles, hazards, or excavations at night shall have flashing lights. If the protected area exceeds 30 m (100 ft) in length, steady burning lights shall be substituted for flashing lights. Drums and barricades for channelizing

traffic and tapers shall have steady burning lights. All barricade lights shall be bi-directional except lights on taper barricades, which shall be monodirectional.

#### **702.05 Signs.**

- (a) General. Sign posts shall be either wood or metal. Wood sign posts shall be according to Articles 1007.12 and 1093.01 except the size shall be 100 x 100 mm (4 x 4 in.). Metal sign posts shall be according to Section 1006. Galvanizing of metal posts will not be required. Alternate designs and or materials may be permitted when approved by the Engineer.

Signs on temporary supports shall be within 20 degrees of a vertical position. Weights of concrete, stone, or brick will not be allowed and all weights used to stabilize signs other than sandbags must be rigidly attached to the sign support as close to the ground as possible.

Post mounted signs shall be erected and maintained within five degrees of a vertical position. Two posts shall be used for signs greater than 1.5 sq m (16 sq ft) in area or where the height between the sign and the ground exceeds 2.1 m (7 ft). Bracing no heavier than 50 x 100 mm (2 x 4 in.) wood may be used for added support. Any brace placed parallel to the road shall be sloped down toward approaching traffic.

When approved by the Engineer, skids may be used to support signs where posts are impractical. They shall not exceed the structural design of Type III barricades and shall be no greater than 1.2 m (4 ft) in length.

Where construction operations result in a temporary drop-off at the edge of a completed stabilized shoulder and the road has a posted speed limit of 55 mph or greater and is open to traffic, "SHOULDER DROP-OFF" (W21-I103) signs shall be used. The Contractor shall place the signs at the beginning of the dropoff area, just beyond freeway interchanges or major intersections on nonfreeways, and at such other locations within the dropoff area as the Engineer may direct to ensure a nominal spacing of 3 km (2 miles). The signs shall be placed just prior to the work which will result in the drop-off and shall remain in place until the drop-off is eliminated. This work shall be considered as included in the contract unit prices for the construction items involved and no additional compensation will be allowed.

When work operations exceed four days, all signs shall be post mounted unless the signs are located on the pavement or defining a moving or intermittent operation. Signs located on the pavement shall be skid mounted. Longitudinal dimensions shown on the plans for the placement of signs may be increased up to 30 m (100 ft) in order to avoid obstacles, hazards, or to improve sight distance, when approved by the Engineer. "ROAD CONSTRUCTION AHEAD" signs will also be required on the side roads located within the limits of the mainline "ROAD CONSTRUCTION AHEAD" signs.

- (b) Arrow Boards. On roads with speeds of 45 mph and above, Type C units shall be used for all operations 24 hours or more in duration, and Type B units may be used for operations less than 24 hours in duration. Type A, B,

or C units may be used for all operations on roads with speeds less than 45 mph. Arrow boards shall not be used to direct passing moves into lanes used by opposing traffic or to shift traffic without having a lane change.

- (c) Construction Speed Limit Sign. The sign assembly shall be trailer mounted according to Article 1106.04. All signs shall be reflectorized meeting the requirements of Article 1084.02. The signs may be combined on a single panel.

The flashing lights for the Construction Speed Limit signs shall feature monodirectional amber lenses with reflectors and shall be visible through a range of 120 degrees when viewed facing the sign. The light shall be either strobe, halogen, or incandescent lamps, be visible for a minimum distance of 1.6 km (1 mile), and have a minimum flash rate of 40 per minute. A small flashing "on" indicator light shall be provided on the back of the sign visible for 150 m (500 ft) to provide confirmation to workers the light is operating. The lights shall operate on either full battery power with solar panel charging (capable of maintaining a charged battery level) and 135 A, 12 V deep cycle battery(s), or a gasoline or diesel powered generator with a maximum fuel capacity of 95 L (25 gal).

- (d) Work Zone Speed Limit Signing.

- (1) Multi-lane Work Zone Speed Limit. Sign assemblies consisting of a 0.9 x 1.2 m (36 x 48 in.) "SPEED LIMIT" 10 mph less than the posted speed, but not less than 55 mph and 0.9 x 0.9 m (36 x 36 in.) "WORK ZONE" sign shall be located, one on each shoulder 150 m (500 ft) before the start of the lane tapers for lane closures on multi-lane roadways. Two additional assemblies shall be placed 150 m (500 ft) beyond the last entrance ramp for each interchange. Sign trailers may be utilized for signs for moving operations and skids may be utilized for signs on projects where work operations will last three days or less. For all other projects these signs shall be post mounted using two wood or metal posts and installed as shown on Standard 702001. All existing "SPEED LIMIT" signs located within the work zone shall be removed or covered. This work shall be coordinated with the lane closure(s) by promptly establishing a reduced posted speed zone when the lane closure(s) are put into effect and promptly reinstating the posted speed zone when the lane closure(s) are removed.

One 750 mm x 1.2 m (30 x 48 in.) "END WORK ZONE SPEED LIMIT" sign shall be located at the end of the lane closure. If the lane closure terminates at the end of the project, then this sign replaces the "END CONSTRUCTION" sign, if it is required.

- (2) Construction Speed Limit Signing. Two sign assemblies shall be located one on each shoulder for multi-lane roadways where the median is at least 3 m (10 ft) wide. When specified on other roadways, one device will be required on the right shoulder for each direction of traffic. Additional assembly(s) shall be placed 150 m (500 ft) beyond the last entrance ramp for each interchange and at each side road(s).

One of these sign assemblies shall be positioned adjacent to the closed lane at a distance of 150 m (500 ft) minimum to 750 m (2500 ft) maximum in advance of any worker(s) throughout the length of the lane closure and as directed by the Engineer. The signs shall be installed on trailers according to Article 1106.04. Care should be used in adjusting the position of these signs in relation to other signs and devices. The sign locations are approximate and should be adjusted to allow approximately 150 m (500 ft) spacings between these signs and other signs. They should be positioned in such a manner that all motorists approaching a worker(s) shall have an unobstructed view of one or more of these signs.

The speed limit shown shall be 10 mph below the posted or work zone speed limit.

When the Construction Speed Limit sign assembly is used, the "END WORK ZONE SPEED LIMIT" sign shall be erected at the end of the lane closure. If the lane closure terminates at the end of project, then the "END WORK ZONE SPEED LIMIT" sign replaces the "END CONSTRUCTION" sign, if it is required.

The flashing lights shall be activated only when workers are present in a closed lane adjacent to one open to traffic and as directed by the Engineer. At all other times, the lights shall be turned off and the Construction Speed Limit sign assembly shall be promptly removed or covered. When both the Work Zone and Construction Speed Limit signs are no longer in effect the "END WORK ZONE SPEED LIMIT" sign shall be removed or covered and the posted speed shall be promptly reinstated.

The Construction Speed Limit sign assemblies will not be required when the worker(s) are located behind a concrete barrier wall.

- (e) Flagger Traffic Control Paddle. This sign shall be used by the flagger in lieu of flags or other signaling devices. The "STOP" face shall consist of white letters and border on a red retroreflectorized background. The "SLOW" face shall consist of black letters and border on a fluorescent orange retroreflectorized background. All reflective faces shall be fabricated with sheeting according to Article 1084.02. Areas outside sign borders shall be light blue or black. The portion of the staff within the sign face shall match the sign colors. All colors and letters shall meet applicable federal standards.

The staff shall consist of two sections joined by a coupling located 1.5 m (5 ft) from the bottom of the staff.

**702.06 Basis of Payment.** This work will not be paid for separately but shall be considered as included in the cost of the traffic control and protection specified in Section 701.

**SECTION 703. WORK ZONE PAVEMENT MARKING**

**703.01 Description.** This work shall consist of furnishing, installing, maintaining, and removing short term and temporary pavement markings.

**703.02 Materials.** Materials shall be according to the following Articles in Section 1000 - Materials:

Item	Article/Section
(a) Pavement Marking Tape .....	1095.06
(b) Painted Pavement Markings .....	1095.02

**CONSTRUCTION REQUIREMENTS**

**703.03 General.** Short term pavement markings shall consist of abbreviated patterns for edge, lane and centerline markings. Within a specified time limit, short term pavement markings shall either be resurfaced or replaced with the full pavement marking patterns indicated on the plans with either a temporary material paid for as temporary pavement marking or with permanent material. Within the conditions as specified, the Contractor may be required to place all or a part of the quantities shown on the plans for short term pavement markings and temporary pavement markings.

The surface to which the pavement marking is to be applied shall be clean and dry. Pavement marking tape shall be applied to the prepared surface according to the manufacturer's recommendations or by a method approved by the Engineer. Painted lines shall be installed according to Section 780 except hand-operated stripers may be used for all applications of short term and temporary pavement marking.

**703.04 Short Term Pavement Markings.** Before the lane is opened to traffic, appropriate Short Term Pavement Markings shall be installed between all lanes open to traffic. Centerline or lane line markings shall consist of an abbreviated pattern of single stripes 1.2 m (4 ft) in length and a minimum of 100 mm (4 in.) wide at a maximum spacing of 12 m (40 ft) between stripes. Centerlines on two-lane highways shall be yellow and lane lines separating two or more lanes of traffic moving in the same direction shall be white. Edge line markings shall consist of 1.2 m (4 ft) stripes on 30 m (100 ft) centers installed at approximately a four degree diagonal pointing in the direction of traffic. Edge line markings will only be required on multilane divided highways and other highways with a paved shoulder greater than 1.2 m (4 ft) wide. Markings on the final wearing surface shall be transversely offset from the permanent pavement marking location as directed by the Engineer. Markings shall be removed within five days after the permanent pavement markings are installed.

The short term pavement markings shall be replaced with the required full standard pavement markings consisting of either temporary or permanent pavement marking as soon as possible. Except as indicated below, temporary pavement marking or the permanent pavement markings shall be installed for no passing zones within three calendar days and for all other markings within 14 calendar days, respectively, after the completion of any intermediate or final surface treatment. This time restriction shall begin at the completion of each intermediate or final lift on resurfacing projects.

If the existing markings are obliterated by milling or any other surface treatment, the time restriction shall begin when the entire surface has been treated. These restrictions may be delayed by the Engineer whenever the Contractor cannot apply pavement markings due to unanticipated inclement weather (other than winter shutdown on the project), strike activities, or other circumstances beyond the Contractor's control as determined by the Engineer. In these cases, the required full standard temporary or permanent markings shall be installed as soon as construction activities are resumed. Prior to winter shutdown, standard edge lines, lane lines, centerlines, no passing zones, and any other necessary markings as determined by the Engineer shall be installed on any intermediate or final surface remaining open to traffic during the winter shutdown period.

**703.05 Temporary Pavement Marking.** When any intermediate course cannot be overlaid or if the final surface cannot be permanently marked within the time restrictions listed above, the full standard markings shall be installed with temporary pavement marking. The temporary markings shall be of the same color and dimensions as shown on the plans for the permanent markings, or as directed by the Engineer.

Type I or Type II marking tape or paint shall be used at the option of the Contractor, except paint shall not be applied to the final wearing surface unless authorized by the Engineer for late season applications where tape adhesion would be a problem. Type III marking tape shall be used on the final wearing surface when the temporary pavement marking will conflict with the permanent pavement marking such as on tapers, crossovers and lane shifts.

Except during winter shutdown periods, temporary pavement marking showing deterioration for any reason within seven days after placement, shall be replaced by the Contractor at his/her own expense. Temporary pavement markings which are in conflict with subsequently established pavement markings, or which interfere with the permanent pavement markings, shall be removed. Marking tape or paint placed on the final wearing course shall be transversely offset from the permanent pavement marking planned location as directed by the Engineer. All remaining temporary pavement marking tape or paint shall be removed within five working days after placement of the permanent pavement marking. When edge lines or channelizing lines are required, they shall be continuous. When continuous sections of tape are used, they shall be cut completely through at intervals of approximately 8 m (25 ft).

Instead of pavement markings, no passing zones on two-lane and three-lane roads may be identified by either the pennant "NO PASSING ZONE" warning sign or both the "DO NOT PASS" and "PASS WITH CARE" regulatory signs in conjunction with Short-Term Markings for periods of time up to three calendar days after an intermediate or final lift is completed on resurfacing projects.

These signs may also be used in lieu of pavement markings on low volume roads until it is practical and possible to install the permanent pavement markings.

If, in the traffic control plan, the road is specified as low volume, it is exempt from the requirements regarding no-passing zone pavement markings.

**703.06 Method of Measurement.** Short term pavement markings and temporary pavement markings of the various line widths will be measured for payment in meters (feet) in place and accepted. Double yellow lines will be measured as two separate lines.

The replacement of temporary pavement markings of the various line widths during winter shutdown periods will be measured for payment in meters (feet) as specified above, except only those pavement markings directed by the Engineer to be replaced will be measured for payment.

Letters and symbols used in conjunction with temporary pavement marking conforming to the sizes and dimensions specified will be measured for payment in square meters (square feet) according to the areas listed in Table 1, Section 780.

Short term and temporary pavement marking removal will be measured in square meters (square feet).

**703.07 Basis of Payment.** This work will be paid for at the contract unit price per meter (foot) for SHORT TERM PAVEMENT MARKING or for TEMPORARY PAVEMENT MARKING of the line width specified, and at the contract unit price per square meter (square foot) for TEMPORARY PAVEMENT MARKING LETTERS AND SYMBOLS. Removal will be paid for at the contract unit price per square meter (square foot) for WORK ZONE PAVEMENT MARKING REMOVAL.

When temporary pavement marking is shown on the Standard, the cost of the temporary pavement marking will be included in the cost of the Standard.

When Pavement Marking Tape, Type III is specified in the contract other than on a Standard, the work will be paid for at the contract unit price per meter (foot) for PAVEMENT MARKING TAPE, TYPE III of the line width specified and at the contract unit price per square meter (square feet) for PAVEMENT MARKING TAPE, TYPE III - LETTERS AND SYMBOLS.

## SECTION 704. TEMPORARY CONCRETE BARRIER

**704.01 Description.** This work shall consist of furnishing, placing, maintaining, relocating and removing precast concrete barriers at temporary locations as shown on the plans or as directed by the Engineer.

**704.02 Materials.** All materials shall be according to the following Articles of Section 1000 - Materials.

Item	Article/Section
(a) Portland Cement .....	1020
(b) Reinforcement Bars .....	1006.10
(c) Welded Wire Fabric (Note 1) .....	1006.10

Note 1. Welded wire fabric shall be 150 mm x 150 mm, 5.7 mm diameter (6 in. x 6 in. , W4 x W4) weighing approximately 2.8 kg/sq m (58 lb/100 sq ft).

### CONSTRUCTION REQUIREMENTS

**704.03 General.** Precast barrier units shall be constructed according to the applicable portions of Sections 504 and 1020. Precast units shall not be removed from the casting beds until a flexural strength of 2,000 kPa (300 psi) or a compressive strength of 10,000 kPa (1400 psi) is attained. Transportation of precast sections to the jobsite will not be allowed until a flexural strength of not less 4,500 kPa (650 psi) or a compressive strength of not less than 24,000 kPa (3500 psi) is attained. In no case may precast units be loaded, shipped, and used prior to four days after casting.

The wall units shall be reinforced with either deformed bar reinforcement or welded wire fabric according to the details shown on the plans. The inserts for M12 (1/2 in.) bolts shall be capable of 13 kN (3000 lb) pull-out strength and shall be furnished with a galvanized bolt and washer.

The Contractor shall have the option of furnishing the barrier units with or without the longitudinal keyway.

The temporary barriers shall be removed when no longer required by the contract.

**704.04 Barrier Markings.** Each unit of precast barrier shall be clearly marked with the name or trademark of the manufacturer, the Illinois Department of Transportation standard and subscript number (i.e. 704001- ) and the date of manufacture. If the manufacturer has more than one plant, the plant identification shall also be included. The markings shall be indented on the barrier section or painted thereon with waterproof paint.

**704.05 Configuration.** Precast units which have the New Jersey configuration and which have previously been cast meeting earlier Department standards, may be used. The units shall be in good condition, without cracks or spalls, and the connection devices shall not be broken. The Contractor will be allowed to mix barrier units of previous designs in the same run with new units, provided the connection devices are compatible and the units are of the same width so a smooth, continuous face can be obtained. Connection devices other than those shown on the plans may be used with the approval of the Department.

Units of other designs from other agencies having the New Jersey configuration may be used with the approval of the Engineer. The Contractor will be required to furnish a certification signed by a responsible official of the outside agency stating the barrier design is currently acceptable and has been inspected and approved by them.

**704.06 Installation.** Barrier units shall only be installed to deflect traffic. Gaps in the barrier shall not be permitted. Barrier shall remain in place until the hazard no longer exists, and then should be removed completely. Each successive set of barriers shall be equipped with tapers for each direction of approaching traffic.

Barrier units shall be placed and pinned together in a continuous smooth line at the exact locations provided by the Engineer. The connecting pin for the pin and loop connection, may be either a plain 22 mm (7/8 in.) diameter or a deformed No. 25

(No. 7) bar meeting the requirements of Article 1006.10(b) except Grade 400 (Grade 60) bars shall be used.

Barrier units or attachments damaged during transportation or handling, or by traffic during the life of the installation, shall be repaired or replaced by the Contractor at his/her expense. The Engineer will be the sole judge in determining which units or attachments require repair or replacement.

The barrier units shall be seated with styrofoam pads except when specified in the plans to be secured with dowel bars. The dowel bars shall be 25 mm (1 in.) in diameter, at least 300 mm (12 in.) long, shall be embedded at least 200 mm (8 in.) into the underlying roadway structure and shall not project above the outer surface of the barrier. After dowel bar removal, all holes in the roadway structure shall be filled with a material approved by the Engineer.

When the temporary concrete barrier terminal section is used it shall be secured to the underlying roadway structure with a drift pin. The hex nut on the drift pin shall be threaded half way onto the pin and tack welded, or coupling nut tightened sufficiently to prevent loosening may be used. The nut shall then be filled with grease to exclude contaminants. After drift pin removal, the hole in the roadway structure shall be filled with a material approved by the Engineer.

When temporary concrete barriers are to be relocated, the units shall be removed from the old location, transported to the new location, and reinstalled as previously specified.

**704.07 Method of Measurement.** Temporary concrete barrier will be measured for payment in meters (feet) in place along the centerline of the barrier. Terminal sections will be measured as units of each. When stage construction requires barriers to be relocated within the limits of the jobsite, the relocated temporary concrete barrier, including terminal sections, will be measured for payment in meters (feet) in place along the centerline of the barrier and terminal sections.

**704.08 Basis of Payment.** When the Contractor furnishes the barrier units, this work will be paid for at the contract unit price per meter (foot) for TEMPORARY CONCRETE BARRIER or RELOCATE TEMPORARY CONCRETE BARRIER and at the contract unit price each for TEMPORARY CONCRETE BARRIER TERMINAL SECTION.

When the Department furnishes the barrier units, this work will be paid for at the contract unit price per meter (foot) for TEMPORARY CONCRETE BARRIER, STATE OWNED or RELOCATE TEMPORARY CONCRETE BARRIER, STATE OWNED, and at the contract unit price each for TEMPORARY CONCRETE BARRIER TERMINAL SECTION, STATE OWNED.

## **SECTION 705. TEMPORARY STEEL PLATE BEAM GUARDRAIL**

**705.01 Description.** This work shall consist of furnishing, erecting, maintaining, and removing steel plate beam guardrail, including posts and traffic barrier terminals.

**705.02 Materials.** Materials shall be according to the following Articles in Section 1000 - Materials:

Item	Article/Section
(a) Rail Element Plates, End Section Plates, and Splice Plates.....	1006.25
(b) Bolts, Nuts, Washers and Hardware .....	1006.25
(c) Wood Posts and Wood Block .....	1007.01, 1007.02, 1007.06
(d) Steel Posts, Blockouts, Restraints, and Wire Rope for Guardrail	1006.04
(e) Preservative Treatment .....	1007.12
(f) Hollow Structural Tubing .....	1006.27(b)

### CONSTRUCTION REQUIREMENTS

**705.03 General.** Construction of the temporary steel plate beam guardrail and temporary traffic barrier terminals shall be according to the applicable requirements of Sections 630 and 631, respectively.

The guardrail shall be removed after use and shall become the property of the Contractor.

**705.04 Method of Measurement.** Temporary steel plate beam guardrail will be measured for payment in meters (feet). The length measured will be the overall length of rail erected, measured along the top edge of the rail elements to the limits shown on the plans.

The various types of temporary traffic barrier terminals will be measured for payment complete in place in units of each. The pay limit between the terminal and the adjacent guardrail shall be as shown on the plans.

**705.05 Basis of Payment.** This work will be paid for at the contract unit price per meter (foot) for TEMPORARY STEEL PLATE BEAM GUARDRAIL of the type specified and at the contract unit price each for TEMPORARY TRAFFIC BARRIER TERMINAL of the type specified. The Contractor, in preparing his/her bid prices shall take into consideration the salvage value of the removed materials.



## **SECTION 1084. TRAFFIC CONTROL DEVICES AND CONSTRUCTION SIGNS**

**1084.01 Flashing and Steady Burning Barricade Lights.** Barricade lights shall consist of a metal or plastic case, transistorized electrical circuit and head. Lights shall be maintained so as to be visible on a clear night from a distance of 900 m (3000 ft). Type B lights, when required for daylight operations, shall be maintained so as to be visible on a sunny day from a distance of 300 m (1000 ft) when viewed without the sun directly on or behind the light. All lights shall meet the requirements of the Institute of Transportation Engineers Standard for Flashing and Steady-Burn Barricade Warning Lights. Lights are classified as follows:

- Type A - Low intensity flashing
- Type B - High intensity flashing
- Type C - Steady burning

- (a) Internal Power (Batteries): The batteries shall be provided by the Contractor but shall not be installed until the light is ready to be used. The light shall be constructed so when the batteries are installed, the terminals are on top of the battery. The batteries shall be contained within the case. The battery terminals shall be either plug or spring type. All electrical connections shall be of noncorrosive material.
- (b) External Power: If external power is supplied, then all power connections shall be hermetically sealed. The method of installing these lights shall be approved by the Engineer. There shall be an isolated fuse for each light. The fuse shall be located near the pavement edge between the light and the power source and shall be installed so that if one light is damaged, causing

a short circuit, all lights will not be extinguished. In all cases, an additional emergency power supply shall be present for operation in the event of power failure. A portable generator may be used as a primary or secondary power source.

- (c) Case: The case for the battery shall be constructed of aluminum, galvanized steel, or plastic of an orange, white, or metallic color. The case shall have a vandal-proof fastener on either or on both the side and back, suitable for mounting on barricades or signs. The case shall be weatherproof.
- (d) Photoelectric Cell: All Type A and C lights shall be equipped with a switching circuit activated by a photoelectric cell. Type B lights may also be equipped with a photoelectric cell when 24-hour operation is not required in the contract.
- (e) Testing and Marking: All lights shall be tested and certified as meeting these requirements by an independent laboratory. Two copies each of the full testing report and certification shall be provided to the Engineer. The report shall specify the lens manufacturer and part number, the circuit manufacturer and part number, the bulb number, and the minimum operating voltage at which the unit meets the intensity requirements of these Specifications. Each light shall be plainly and permanently marked with the type, manufacturer's name, and model number.

#### 1084.02 Reflective Sheeting.

- (a) Channelizing Devices. At the time of manufacturing, the reflective sheeting used on barricades and vertical panels as shown on Highway Standard 702001 shall have the following initial minimum coefficient of retroreflection expressed as average candelas per lux per sq m (candelas per foot candle per sq ft) of material. Measurements shall be conducted according to ASTM E 810.

Color	Observation Angle 0.2 Entrance Angle		Observation Angle 0.5 Entrance Angle	
	-4	+30	-4	+30
Silver/White	140.0	60.0	50.0	28.0
Orange	42.0	15.0	14.0	8.0

The reflective sheeting on drums shall conform to the requirements for barricades and vertical panels except that drums with steady-burn lights shown for lane closure tapers and runarounds on Highway Standards 701401, 701421 and 701416, and flexible delineators shown on Highway Standard 702001 shall conform to the following initial minimum coefficient of retroreflection.

Color	Observation Angle 0.2 Entrance Angle		Observation Angle 0.5 Entrance Angle	
	-4	+30	-4	+30
Silver/White	250.0	100.0	95.0	50.0
Orange	100.0	30.0	40.0	150

Sheeting color and surface shall be according to the requirements contained in Article 1084.02(b).

- (b) Construction and Maintenance Signs. All orange signs used shall be fluorescent orange in color and meet the initial minimum brightness values of the orange sheeting shown in the following table. The sign face shall consist of reflective sheeting with the appropriate screened message. The reflective sheeting shall consist of glass spherical lens elements or plastic microprismatic elements covered with a transparent plastic film having a smooth, sealed surface, except that a rectangular pattern may be embossed into the film. The sheeting shall be weather resistant.

At the time of manufacturing, the reflective sheeting shall have the following initial minimum coefficient of retroreflection at 0.2 and 0.5 divergence expressed as average candelas per lux per sq m (candelas per foot candle per sq ft) of material. Measurements shall be conducted according to ASTM E 810.

Color	Observation Angle 0.2 Entrance Angle		Observation Angle 0.5 Entrance Angle	
	-4	+30	-4	+30
Red	45.0	25.0	15.0	10.0
Silver/White	90.0	40.0	41.0	21.0
Yellow	60.0	30.0	25.0	13.0
Orange	100.0	30.0	40.0	15.0

The sheeting color shall conform to the appropriate standard color tolerance chart issued by the U.S. Department of Transportation, Federal Highway Administration.

The sheeting surface shall be smooth and flat, easily cleaned, have satisfactory wet performance, and exhibit 85° gloss-meter rating of not less than 40 when tested according to the Test for Specular Gloss, ASTM D 523. The sheeting surface shall be readily processed and compatible with

recommended transparent and opaque process inks and show no loss of the color coat with normal handling, cutting and applications.

**1084.03 Temporary Rumble Strips.** The rumble strip shall be black in color and formed of high strength polycarbonate. The strip shall be of one-piece construction with two channels on the underside for flexibility and proper adhesive bondage. The channels shall be interconnected at four or more locations to permit the bonding material to flow from one channel to the other. There shall be at least six weep holes through one or both channels to the upper surface of the strip and at least four through the leading edge of the strip to prevent air voids between the strip and the bonding material.

The rumble strip shall be capable of supporting a load of 2700 kg (6000 lb). The load capacity shall be determined by placing a strip over the open end of a 25 mm (1 in.) high vertically-positioned hollow metal cylinder having an internal diameter of 75 mm (3 in.) and a wall thickness of 6 mm (1/4 in.). The load shall be applied slowly through a 25 mm (1 in.) diameter by 25 mm (1 in.) high metal rod centered on the top flat portion of the strip. No weep holes shall be in the compression area. Breakage or significant permanent deformation of the strip shall constitute failure. Other similar designs may be used with the approval of the Engineer.

**1084.04 Construction and Maintenance Signs.** All signs used for temporary traffic control shall meet the approval of the Engineer. The sheeting shall be mounted on rigid material such as aluminum or exterior grade plywood. Signs utilizing a base of fabric, fiberboard, or other highly flexible or frangible material will not be permitted, except signs having a reflective sheeting face bonded to a durable plastic or fabric base will be permitted, (a) in work zones with posted speeds above 45 mph when workers are present to maintain the devices and (b) in all work zones having posted speeds of 45 mph or less.



**1095.06 Pavement Marking Tape.** White or yellow marking tape shall consist of glass spheres of high optical quality embedded into a binder on a suitable backing that is precoated with a pressure sensitive adhesive. The spheres shall be of uniform gradation and distributed evenly over the surface of the tape.

The material shall be white or yellow as specified. The colors shall conform closely to Federal color tolerances for pavement marking paint.

The white and yellow tape shall be readily visible when viewed under automotive headlights at night. Reflective values, measured in accordance with the photometric testing procedure of ASTM D4061 shall not be less than those listed in the table below. The Coefficient of Retroreflected Luminance  $R_1$ , shall be expressed as average millicandelas/lux/sq m (millicandelas/foot candle/sq ft), measured on a 600 mm x 300 mm (2 ft x 1 ft) panel at 86 degree entrance angle.

Coefficient of Retroreflected Luminance					
Types I and II			Type III		
Observation Angle	White	Yellow	Observation Angle	White	Yellow
0.2	2700	2400	0.2	1300	1200
0.5	2250	2000	0.5	1100	1000

The pavement marking tape shall have a precoated pressure sensitive adhesive and shall require no activation procedures. Test pieces of the tape shall be applied according to the manufacturer's instructions and tested according to ASTM D 1000, Method A, except that a stiff, short bristle roller brush and heavy hand pressure will be substituted for the weighted rubber roller in applying the test pieces to the metal test panel. Material tested as directed above shall show a minimum adhesion value of 30 g/mm (750 g/in.) width at the temperatures specified in ASTM D 1000. The adhesive shall be resistant to oils, acids, solvents, and water, and shall not leave objectionable stains or residue after removal. The material shall be flexible and conformable to the texture of the pavement.

Type III tape shall be capable of performing for the duration of a normal construction season and shall then be capable of being removed intact or in large sections at pavement temperatures above 4 °C (40 °F) either manually or with a roll-up device without the use of sandblasting, solvents, or grinding. The Contractor shall provide the Engineer certification, from the manufacturer of the Type III tape, that the material to be furnished meets the requirements for being removed after the following minimum traffic exposure based on transverse test decks with rolling traffic:

- (a) Time in place - 400 days
- (b) ADT per lane - 9,000 (28 percent trucks)
- (c) Axle hits - 10,000,000 minimum

Samples of the material, applied to standard specimen plates will be measured for thickness, and tested for durability in accordance with Federal Test Method Standard No. 141A, Method 6192, using a CS-17 wheel and 1000-gram load, and shall meet the following criteria for minimum initial thickness and for durability, showing no significant change in color after being tested for the number of cycles indicated:

Test	Types I & II		Type III	
Initial Thickness mm (Mils)	White 0.51 (20)	Yellow 0.51 (20)	White 0.51 (20)	Yellow 0.51 (20)
Durability (Cycles)	5,000	5,000	1,500	1,500

The pavement marking tape, when applied according to the manufacturer's recommended procedures, shall be weather resistant and shall show no appreciable fading, lifting, or shrinkage during the useful life of the marking. The tape, as applied, shall be of good appearance, free of cracks, and edges shall be true, straight, and unbroken.

## SECTION 1106. TRAFFIC CONTROL EQUIPMENT

**1106.01 Truck Mounted Attenuators.** The attenuator shall be an approved unit that has been successfully crash tested with vehicles weighing 1000 to 2200 kg (2200 to 4800 lb) and impacting the unit at 70 km/h (45 mph).

**1106.02 Shadow Vehicles.** The shadow vehicle required for the truck mounted attenuator shall have a minimum gross vehicle weight rating of 12,250 kg (27,000 lb).

**1106.03 Arrow Boards.** Arrow boards shall be used where shown on the plans or as directed by the Engineer. Minimum legibility distances are those at which the arrow board can be comprehended by a driver on a sunny day or clear night.

Arrow boards shall be rectangular, of solid construction, and finished with nonreflective flat black. The boards shall be mounted as shown on Standard 702001. Remote controls should be provided with roof mounted arrow boards.

Arrow boards shall have the capability of the following mode selections: (1) left or right flashing shaft with arrow point; (2) flashing shaft with double arrow points; and (3) caution. The arrow point shall be composed of at least five lamps at an angle of 35 to 60 degrees measured from the horizontal shaft which shall be composed of at least three lamps. Shafts in the double arrow point mode shall be composed of at least two lamps for Type A units and three lamps for Type B and C units. The caution mode shall consist of four or more lamps, arranged in a pattern which will not indicate a direction. The lamps or lenses shall be recess mounted or alternately equipped with an upper hood of not less than 180 degrees, and the color emitted shall be yellow. The lamps shall be 12 V, water proof units, consisting of LED, Halogen or sealed incandescent beams, spaced so as to substantially fill the board. Lamps shall be capable of a minimum of 50 percent dimming from their rated voltage. The flashing rate shall not be less than 25 nor more than 40 flashes per minute. Minimum lamp on time, shall be 50 percent (no lamps shall remain illuminated during "off" time). All units shall have a permanently mounted voltmeter indicating the voltage available to the lamps. Trailer mounted units shall be equipped with a minimum of two indicator lamps on the near side of the arrow board.

Arrow Board Type:	A	B	C
Minimum Lamp Size	PAR 36	PAR 36	PAR 46
Minimum Number of Lamps	12	13	15
Minimum Legibility Distance			
Meters	800	1200	1600
Miles	1/2	3/4	1

The power to operate the arrow board may be supplied from self-contained batteries, (with or without a solar panel generator), a vehicles' electrical system, a gasoline or diesel fueled generator, or an external power source. Where batteries are used as the primary power source, they shall be capable of providing sufficient

voltage, between charging, to each of the lamps for a period of at least 72 continuous hours or operation, in any mode at full daylight intensity. Units utilizing gasoline or diesel fueled generators or an external power source shall be equipped with storage batteries wired so the unit will automatically switch to battery power in the event of failure of the primary power source. The batteries shall be capable of providing sufficient capacity to the lamps for at least three continuous hours of operation in any mode at full daylight intensity.

Where an external power source is used, the cable placement shall meet the approval of the Engineer, and all electrical codes applicable to the area shall be observed. When greater than 24 V is supplied externally, the service cable shall be fused at a location sufficiently removed from the unit so as to leave no live wires exposed at or near the unit in the event of a vehicular collision.

Trailer-mounted units shall be equipped with a photoelectrically operated switch capable of varying the lamp voltage from 6 V for nighttime use to 12 V for daylight use. This switch shall not be capable of manual operation. Failure of this switch shall cause the lamps to operate in the dim mode (6 V) only. Roof-mounted units may be equipped with a manually operated voltage control switch.

**1106.04 Sign Trailers.** Small, lightweight trailers may be used as temporary supports for construction and maintenance signs where post mounted signs are not required by the Highway Standards. The trailer, exclusive of signs, flashing light and batteries, shall be no more than 135 kg (300 lb) and shall not be fabricated with heavier than 75 x 75 mm (3 x 3 in.) angles, 63 mm (2 1/2 in.) diameter pipes, or 75 x 50 mm (3 x 2 in.) rectangular tubing. The rim size of the wheels should not exceed 300 mm (12 in.). Automotive or truck rear axle assemblies with differential housings shall not be used. In the erected position, the tires may rest on the ground or be elevated with the bottom of the tires no greater than 150 mm (6 in.) above the ground. No weights other than sandbags shall be used and any sandbag or large batteries for the flashing lights shall rest no higher than 300 mm (12 in.) above the ground. Wheel chocks other than sandbags shall not be used. The tongue may be pinned to the ground (or a paved area if approved by the Engineer) to reduce wind-induced rolling. Such a pin shall be designed to readily pull or break in the event of a vehicular impact. The method of pinning shall be approved by the Engineer.

Each end of the rear rail of the trailer shall be equipped with a 75 mm (3 in.) diameter or equivalent red reflector.

Except when the sign trailer is actually being moved, it shall be detached from the towing vehicle and the towing vehicle parked according to Article 701.04. During nonworking hours, trailers with signs that do not apply to existing conditions shall also be according to Article 701.04.

CHECK SHEET #18

State of Illinois  
Department of Transportation

SPECIAL PROVISION  
FOR  
RESURFACING OF MILLED SURFACES

Effective October 1, 1995

Add the following paragraph to the beginning of Article 440.03 of the Standard Specifications:

"The Contractor shall resurface milled pavement within ten calendar days."

CHECK SHEET #28

State of Illinois  
Department of Transportation

SPECIAL PROVISION  
FOR  
GIVE EM A BRAKE SIGN

Effective August 1, 1989  
Revised August 1, 1991

Give 'em a BRAKE Campaign Sign. This work shall consist of furnishing and erecting two 1200 mm x 1200 mm (48 in. x 48 in.) "Give 'em a BRAKE" warning signs (W-21-I109) in addition to the work zone signing required by the applicable traffic control plan and standards utilized for this project. The sheeting shall be Type B. On two-lane highways, these signs shall be erected midway between the first and second warning signs. Two of these signs shall be erected 300 m (1,000 ft) in advance of the RIGHT (LEFT) LANE CLOSED (1/2 MILE) signs on multilane highways. The signs shall remain in place for the duration of the project. Camera-ready artwork for the signs will be provided to sign manufacturing companies upon request (artwork may be obtained from the Central Bureau of Operations at (217)782-3450).

The cost of furnishing, erecting, and removing these signs shall be included in the cost of Traffic Control items as shown on the plans.

CHECK SHEET #29

State of Illinois  
Department of Transportation

SPECIAL PROVISION  
FOR  
PORTABLE CHANGEABLE MESSAGE SIGNS

Effective November 1, 1993  
Revised February 1, 1996

This work consists of furnishing, placing, and maintaining changeable message sign(s) at the location(s) shown on the plans or as directed by the Engineer.

The sign(s) shall be trailer mounted. The message panel shall be at least 2.1 m (7 ft) above the pavement, present a level appearance, and be capable of displaying up to eight characters in each of three lines at a time. Character height shall be 450 mm (18 in.).

The message panel shall be of either a bulb matrix or disc matrix design controlled by an onboard computer capable of storing a minimum of 99 programmed messages for instant recall. The computer shall also be capable of being programmed to accept messages created by the operator via an alpha-numeric keyboard and able to flash any six messages in sequence. The Contractor is required to promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

The message panel shall be visible from 400 m (1/4 mile) under both day and night conditions. The letters shall be legible from 250 m (750 ft). Whenever the sign(s) are displaying messages, they shall be considered a traffic control device. At all times when no message is displayed, they shall be considered equipment.

The message sign shall include automatic dimming for nighttime operation and a power supply capable of providing 24 hours of uninterrupted service.

The Contractor is required to provide all preventive maintenance efforts s(he) deems necessary to achieve uninterrupted service. If service is interrupted for any cause and not restored within 24 hours, the Engineer shall cause such work to be performed as may be necessary to provide this service. The cost of such work shall be borne by the Contractor or deducted from current or future compensation due Contractor.

The furnishing, placing, and maintaining of Portable Changeable Message Sign(s) shall be paid for per calendar month for each sign as CHANGEABLE MESSAGE SIGN.

**CHECK SHEET #30**

State of Illinois  
Department of Transportation

**SPECIAL PROVISION  
FOR  
DIRECTION INDICATOR BARRICADES**

Effective: July 1, 1999

The following shall be included in Article 702.03:

- (g) Direction Indicator Barricades. Direction indicator barricades shall exclusively be used in lane closure tapers. They shall be used only when traffic is being merged with an adjacent through lane or shifted onto a median crossover. The barricades shall be placed in series in the taper with the arrow panel directing traffic from the closed lane into the adjacent lane or crossover.

The direction indicator barricades shall meet the requirements of Article 702.03(e) for Type II barricades used in lieu of drums. The top panels are 300 mm x 600 mm (12 x 24 in.) with fluorescent orange sheeting meeting the requirements of Article 1084.02(b) for construction and maintenance signs. The top panel indicator arrow shall be 530 mm (21 in.) long with a 240 mm (9.5 in.) wide arrow barb and 90 mm (3.5 in.) wide arrow shaft. The bottom panels are 200 mm x 600 mm (8 x 24 in.) with orange and white striped Type A sheeting meeting the initial minimum coefficient of retroreflection in Article 1084.02(a).

## Traffic Control Deficiency Deduction (BDE)

Effective April 1, 1992

To ensure a prompt response to incidents involving the integrity of the work zone traffic control devices, the Contractor shall provide a telephone number where a responsible individual can be contacted on a 24-hour-a-day basis. When the Engineer is notified or determines a deficiency exists, (s)he shall be the sole judge to whether the deficiency is an immediate safety hazard. The Contractor shall dispatch sufficient resources within 2 hours of notification to make needed corrections of deficiencies that constitute an immediate safety hazard. Other deficiencies shall be corrected within 12 hours. If the Contractor fails to restore the required traffic control and protection within the time limits specified above, the Engineer will impose a daily monetary deduction for each 24-hour period (or portion thereof) the deficiency exists. This time period will begin with the time of notification to the Contractor and end with the Resident Engineer's acceptance of the corrections. For this project, the daily deduction will be \_\_\_\_\* per day. In addition, if the Contractor fails to respond, the Engineer may correct the deficiencies and the cost thereof will be deducted from monies due or which may become due the Contractor. This corrective action will in no way relieve the Contractor of his/her contractual requirements or responsibilities.

\*The cost of the daily deduction will be calculated by dividing three percent of the awarded contract price by the number of calendar days anticipated for this project. The number of days anticipated for this project is \_\_\_\_\_. This procedure is to be followed regardless of whether the contract is based upon working days, contains a completion date, or has an incentive/disincentive clause.

5729I

### **Illinois First Signs (BDE)**

Effective: October 1, 1999

This work shall consist of erecting two 1500 mm x 1200 mm (60 inch x 48 inch) "ANOTHER PROJECT FUNDED BY ILLINOIS FIRST" signs. The signs, which will be provided by the Department shall be erected by the Contractor on two 50 mm x 50mm (2 inch x 2 inch) metal posts furnished by the Contractor. These signs shall be erected according to all applicable portions of Article 702.05(a) and Standard 702001. These signs shall be erected midway between the first and second warning signs as required by the traffic control plan and standards utilized for this project. If the second warning sign is defining a moving or intermittent operation, the Illinois First sign may be maintained at a distance of 150 m (500 ft.) beyond the first post mounted ROAD CONSTRUCTION AHEAD sign. The Illinois First signs shall remain in place for the duration of the project. Upon completion of the project, the signs shall be removed and returned to the department. The posts shall remain the property of the Contractor.

This work will be paid for at the contract unit price each for ILLINOIS FIRST SIGNS.

80014

### **TYPE III BARRICADES**

Effective: November 1, 2000

Revise the third paragraph of subparagraph (b) of Article 702.03 to read:

"Barricade and wing barricade rails shall be no heavier than 25 mm (1 inch) thick lumber or plywood. The width of the rails shall be 200 to 300 mm (8 to 12 inches). Light weight weather resistant materials such as plastic, fiberglass, or sheet aluminum may be used. The face of the barricade rails may be sloping or vertical. Nominal lumber dimensions shall not be used to satisfy barricade component dimensions."

80027

## SAND MODULE IMPACT ATTENUATORS (BDE)

Effective October 15, 1976

Revised: ~~January~~ January 1, 2001 ~~4, 2000~~

Description. This work shall consist of furnishing, erecting, and/or relocating sand module impact attenuators and the construction of attenuator bases when specified.

Impact Attenuators. Impact attenuators shall be the self purging sand module type. The modules shall ~~be manufactured by Roadway Safety Services, Incorporated or by Energy Absorption Systems, Incorporated or approved equivalent~~ meet the testing criteria contained in National Cooperative Highway Research Program (NCHRP) Report 350 and shall be approved by the Department. The modules shall be preassembled to the greatest extent practicable so as to reduce to a minimum the on-site installation time. The attenuator installation shall be located, oriented, and the modules assembled and filled to the nominal weights as shown on the plans. All modules in each installation shall be of the same manufacturer and mixing of the two types will not be permitted. Sand for filling the modules shall conform to the requirements of Article 1003.01 of the Standard Specifications for FA-1 or FA-2 Class A quality. Unbagged sand containing not more than 5% moisture shall be used for filling modules.

Attenuator Bases. At the option of the Contractor, attenuator bases may be constructed of either portland cement concrete or bituminous mixtures. Portland cement concrete bases shall be 150 mm (6 inches) thick and conform to the applicable requirements of Section 424 of the Standard Specifications. Bituminous mixture bases shall be 200 mm (8 inches) thick and conform to the applicable requirements of Section 408 of the Standard Specifications.

The surface of the base shall be slightly sloped or crowned to facilitate drainage. The perimeter of each module and the specified mass (weight) of sand in each module shall be painted on the surface of the base.

Temporary. When specified as temporary, the impact attenuator shall be striped according to Standard 702001 for drums. All maintenance of the temporary impact attenuators shall be the responsibility of the Contractor until removal is directed by the Engineer. When the Engineer determines the sand module impact attenuators are no longer required, the installation shall be dismantled with all sand modules and related hardware becoming the property of the Contractor.

Relocate. When the work specifies relocating the sand module impact attenuators as shown on the plans, each module shall be kept in proper orientation and position. The sand modules shall be refilled with sand when necessary.

Removal and Replacement. When the work specifies removal and replacement of one or more individual sand module impact attenuators damaged by ~~traffic-traffic~~, other than construction traffic, the following will apply. When damage to initial installation occurs, the damaged modules and the contents shall be removed completely and replaced with the required number of modules necessary to restore the installation to its original condition. The Contractor shall dispose of all damaged materials according to Article 202.03 of the Standard Specifications, and

furnish and install new sand modules as directed by the Engineer. Sand modules that are not damaged, but have been laterally shifted from their original position shall be realigned and relocated to the original locations, as directed by the Engineer. Any modules damaged by the Contractor's forces shall be replaced or relocated at his/her expense.

The Contractor shall respond within 12 hours to any call from the Engineer concerning replacement of the sand module impact attenuators. If the Contractor does not respond and does not complete his/her work within 36 hours after initial call from the Engineer, then the Contractor shall be liable to the Department from the time of the initial call, in the amount of \$200/calendar day, per sand module, not as a penalty but as liquidated damages, until replacement occurs.

Method of Measurement. Contract quantities for attenuator bases may be accepted according to Article 202.07(a) of the Standard Specifications. When measured, attenuator bases will be measured in place and the dimensions used to calculate square meters (square yards) will not exceed those as shown on the plans.

When the work specifies temporary placement, relocation and/or replacement, each individual sand module, complete with the required hardware, filled with sand and properly installed, shall constitute one each.

When the work specifies a temporary installation, attenuator bases shall be measured as specified above.

Basis of Payment. This work will be paid for at the contract unit price per square meter (square yard) for ATTENUATOR BASE and at the contract unit price each for INERTIAL BARRIER INSTALLATION. These prices shall include all materials, labor, and equipment necessary to furnish, fabricate, and install the modules in place on the site as shown on the plans, including all earth excavation, borrow, subgrade preparation, shaping, and seeding for attenuator bases.

When the road is open to traffic, the Contractor may request inspection of the permanent completed Impact Attenuator installation at each separate location, and if the Engineer accepts the work, the Contractor will not be responsible for damage to the installation caused by traffic (other than construction traffic). When damage to the accepted installation occurs and it is determined the Contractor is not responsible as outlined herein, repairs to the installation shall be made by the Contractor and payment will be made according to Article 109.04 of the Standard Specifications.

When the work specifies relocating the module attenuators, this work will be paid for at the contract unit price per each for SAND MODULE IMPACT ATTENUATOR, (RELOCATE). ~~Any module damaged by the Contractor shall be replaced with a new module at the Contractor's expense.~~

When the work specifies temporary placement of module attenuators, this work will be paid for at the contract unit price per each for SAND MODULE IMPACT ATTENUATOR, (TEMPORARY), which price shall include all materials, labor and equipment necessary to furnish, fabricate, and install the modules in place at the location shown on the plans, on the

relevant traffic control standard, or as directed by the Engineer. The price shall also include complete removal of the installation when no longer required.

When the work specifies replacing the module attenuators, this work will be paid for at the contract unit price per each for SAND MODULE IMPACT ATTENUATOR, (REPLACEMENT). Realignment and relocation of undamaged units to their original location will not be paid for separately but will be considered as included in the cost of replacement.

80038

## **PLACEMENT OF ARROW BOARDS (BDE)**

Effective: August 1, 2001

Add the following to Article 701.04 of the Standard Specifications:

- "(g) Arrow Boards. Arrow boards shown on standards or in the plans at the beginning of tapers, shall be placed at the beginning of the taper or in the closed lane within the first 90 m (300 ft) of the taper."

80056





